MicroNode I/O™

Ethernet DIDO

User Manual

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Preface

About this manual

This manual is designed to serve as a guideline for the installation, setup, operation and basic maintenance of the MicroNode device. The information contained within this manual, including product specifications, is subject to change without notice. Please observe all safety precautions and use appropriate procedures when handling the MicroNode product and its related software.

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1 General Information

The MicroNode I/O™ product line provides high density, compact and economical I/O solutions for popular Fieldbus Networks. The MicroNode DIDO provides 16 digital input/output points to an Ethernet network. Additional data monitoring is available through a standard web browser and the TOOLweb™ tool side Interface (XML over HTTP). The MicroNode package provides flexible side or foot mounting and easy access to I/O through a standard 37-pin D-Sub connector. Below are the orderable part numbers for all Ethernet DIDO MicroNode configurations.

Table 1 Orderable Part Numbers

AS00270-01	MicroNode I/O, Ethernet MB, DIDO, sink, side
AS00239-01	MicroNode I/O, Ethernet MB, DIDO, sink, front
AS00271-01	MicroNode I/O, Ethernet MB, DIDO, source, side
AS00249-01	MicroNode I/O, Ethernet MB, DIDO, source, front

1.1 Conventions used in this User Manual

Warning	**The WARNING sign denotes a hazard to personnel. It calls attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in injury to personnel.**
Caution	**The CAUTION sign higlights information that is important to the safe operation of the BlueBox, or to the integrity of your files. .**
Note	The NOTE sign denotes important information. It calls attention to a procedure, practice, condition, or the like, which is essential to highlight.

On screen buttons or menu items appear in bold and italics.
Example: Click ***OK*** to save the settings.

Keyboard keys appear in brackets.
Example: [ENTER] and [CTRL]

Pages with additional information about a specific topic are cross-referenced within the text.
Example: (See page xxx)

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2 Installation and Setup

This section describes the digital MicroNode DIDO hardware setup and the Ethernet network interface. I/O connection examples are given in section 2.6.

2.1 Shipping Box Contents

- MicroNode product

2.2 Hardware Description

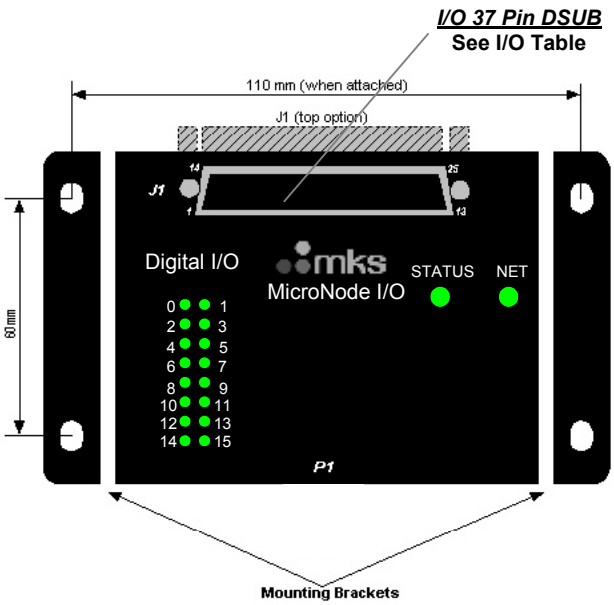

Figure 1 MicroNode DIDO Front Panel

2.3 Installation

Mount the unit on a horizontal or vertical surface, in a suitable location and/or enclosure for your application. Provide sufficient clearance and airflow to maintain a 0°C to 55°C ambient operating temperature range. Fasten the unit to the mounting surface using four screws (not provided) the 4mm wide mounting holes.

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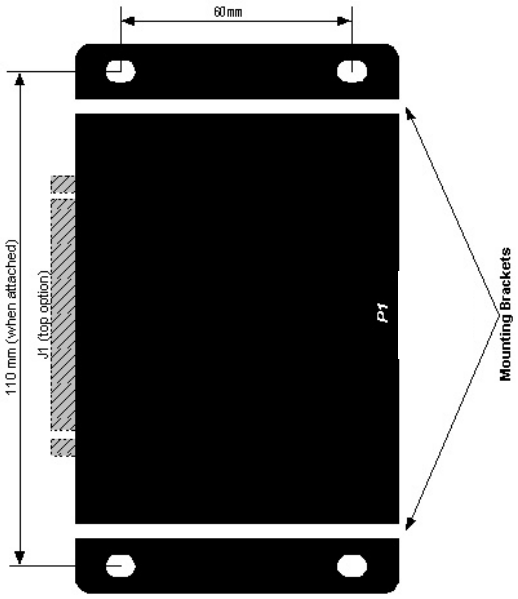

Figure 2 MicroNode Mounting Holes

Note

Height of 34mm, not including 37-pin D-Sub connector

ALL DIMENSIONS ARE METRIC

2.4 Wiring

The MicroNode requires two connections – one to the Ethernet network and one to a 37-pin D-Sub connector. Ethernet and I/O cables are available from a variety of industrial sources. See table below for orderable I/O mating connectors.

Table 2 I/O Mating Connector

Description	MFG	Part Number
37-pin D-Sub Receptacle (solder cup)	Mouser	523-L77-DC37S
37-pin D-Sub Metal Hood	Mouser	523-17E-1727-2

Warning

Follow all applicable electrical codes in your area when mounting and wiring any electrical device.

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2.4.1 Power Supply Wiring

Connect an external 18-30 VDC power supply to the appropriate pins of the **I/O connector**. The connector should be wired according to the connector pin out in Section 2.4.2.

2.4.2 I/O Wiring

The MicroNode provides access to the I/O via a male 37-pin D-Sub connector. The pin out is shown in the following table.

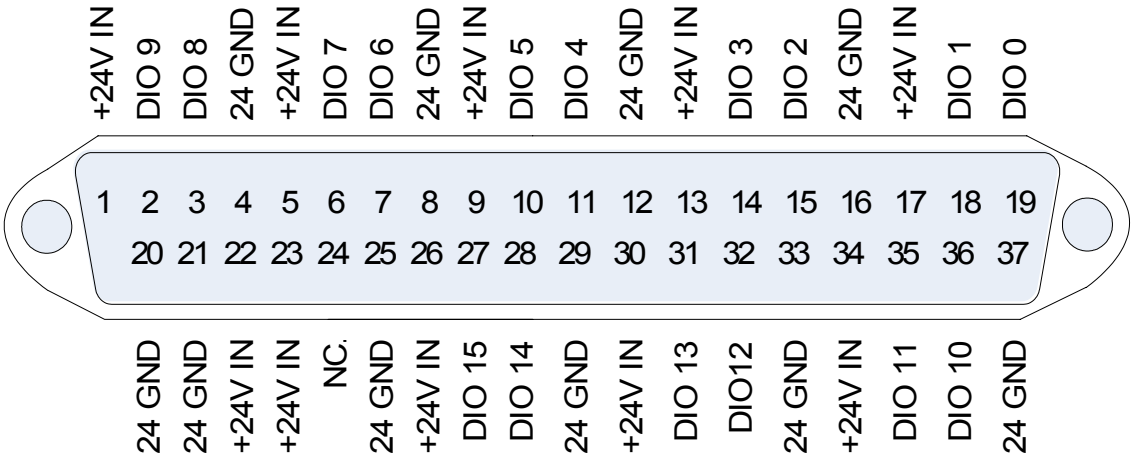

Figure 3 MicroNode DIDO Connector Pin out

2.5 I/O Description

There are multiple control and data monitoring interfaces for the unit:

- Modbus/TCP Ethernet control
- Web browser, manual control
- Web browser, configuration and graphical data monitoring
- XML streaming data acquisition, using TOOLweb™ protocol

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2.6 Digital Input Interface Example

Units are purchased with either sinking (active low) or sourcing (active high) I/O. Each input circuit includes an indicator LED in series with the detection opto-coupler. The opto-coupler isolates the processor from the inputs. The inputs require 1.5 mA in order to turn on.

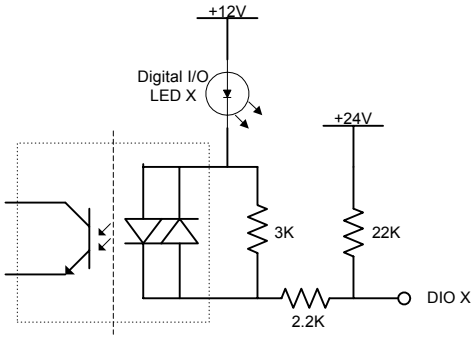

Figure 4 Digital Sinking Input (active low)

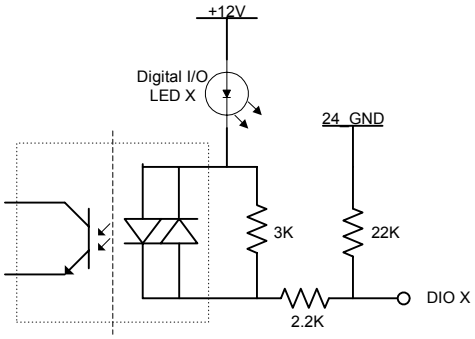

Figure 5 Digital Sourcing Input (active high)

Below is an example of how to use the digital input interface for both the sinking and sourcing hardware configurations. The digital I/O circuitry is powered from an external +24-volt power source via the I/O connector.

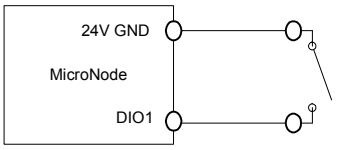

Figure 6 Sinking Input

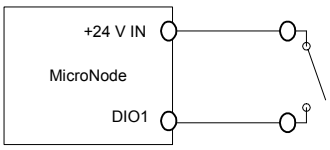

Figure 7 Sourcing Input

2.7 Digital Output Interface Example

The individual outputs will support up to 200 mA load per channel. Each output is thermally protected against short- circuiting (500 mA typically) and includes under voltage protection. The output Fault State is accessible through software. External Schottky diodes are provided for output transient protection and each I/O point is protected with a self-resetting poly fuse rated for 500 mA. Outputs default to the OFF condition during power up and processor reset conditions. The figure below shows the output circuitry.

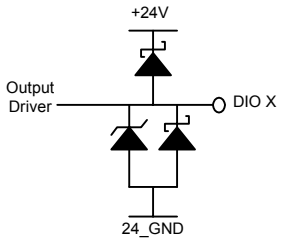

Figure 8 Output Circuit

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Below is an example of how to interface with the digital outputs for both the sinking and sourcing hardware configurations. The digital I/O circuitry is powered from an external +24-volt power source via the I/O connector.

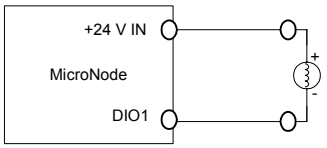

Figure 9 Sinking Output

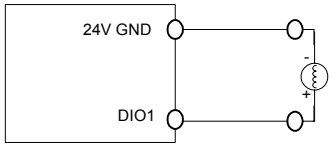

Figure 10 Sourcing Output

2.8 Diagnostic Serial Port

The Ethernet MicroNode has an RS-232 serial diagnostics interface. The serial port provides access to a proprietary command-line interface with specific commands to display advanced or detailed status information, and to control configuration parameters including those available via the Web interface. Some are intended for advanced or factory use, and are not normally exposed via the Web interface.

The command-line interface supports the "help" command, which displays a brief summary of all commands. The commands are self-explanatory to anyone sufficiently familiar with the controller theory of operation, and the technologies involved.

The diagnostics serial port is also be used to display all legally required Copyright messages, current version information, and hardware configuration information during the unit's power-up sequence.

Table 3 Diagnostic Serial Port Connector Pin out (Female DB-9)

Pin	RS232 Function
2	TXD
3	RXD
5	SGND

2.9 Ethernet Connector

The standard 100/10 BaseT Ethernet Port uses a standard shielded RJ45 connector. Indicators for the Ethernet port are located on the front panel.

2.10 Status LED's

There is one LED for the unit status and one for the network status located on the front panel. Indicators for the Ethernet port are also located on the front panel. The table below shows the meaning of different LED states.

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Table 4 Modbus LED Status Conditions

LED Color	Status LED	Network LED
Off	No power	No Power
Solid Red	Not Supported	No Network Response (Disconnected)
Solid Amber	Booting	Network Initializing, configuring DHCP
Alternating Red-Green	Watchdog failure, outputs off	Network Configuration Error
Alternating Red-Amber	I/O failure	Null network, IP address configuration Error
Alternating Green-Amber	Not Supported	Not Supported
Blinking Amber	Unit Okay, Diagnostic Mode, Watchdog Inactive	Standing by for Modbus master to connect
Blinking Green	Unit Okay, Production Mode, Watchdog Active	Modbus master present and active

2.11 Rotary Switches

The Ethernet MicroNode has three rotary switches on its front panel, each switch represents a decimal digit 0 through 9. The switches serve two purposes:

1. Determine the least significant byte of the IP address
2. Determine the operating mode

Table 5 Switch Conditions

Mode	Switch Settings	Watchdog	IP address
Production	000	Enabled	DHCP
Production	001-254	Enabled	192.168.0. (Switch Settings)
Diagnostic	300	Disabled	DHCP
Diagnostic	301-554	Disabled	192.168.0. (Switch Settings – 300)

When the unit is in **normal (production)** mode, the combinations of the rotary switches represent a decimal number between 000 to 254. When the number is between 001 to 254, this number is used to configure the last network segment of the **static** IP address, with a factory set prefix 192.168.9.xxx, or any other prefix that may be configured through the diagnostic serial port. If the rotary switch combination is set to 000, the unit will obtain an IP address automatically using DHCP protocol.

To set the operating mode to **diagnostics mode** set the rotary switches to 300 or above. In Diagnostic mode the watchdog is disabled, and the user is allowed to change the value of the outputs via the Web-based diagnostic pages. Setting the switches to a value of 300 configures the IP address using DHCP, and setting the switches above 300 configures the unit to a static IP address.

For example: A switch setting of 330 means that the diagnostic mode is set, and the IP address is statically configured to 192.168.9.30.

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	Note	Rotary switches settings above 554 are reserved and should not be used.

3 Quick-Start

- Set the IP address switches on the front of the unit to **3 1 0**. The unit is now in Diagnostic mode with a static IP address. The units IP address will be 192.168.0.10. Power the unit by supplying +24 volts to the I/O connector. See section 2.4.2 for wiring information.

- Attach a network crossover cable between the MicroNode and your PC or use a HUB to build a small network.

- Modify your PC network TCP/IP settings using the computer's *Connection Properties* menu to match the following:

  PC IP Address: 192.168.0.1
  PC Netmask: 255.255.255.0

- Open a web browser window and enter **http://192.168.0.10** in the address line. There is a slight delay as the unit transfers content to your local browser. The main Device page is displayed. If you are unable to load the page, check the units switch settings and ensure the IP address of the PC is 192.168.0.1. Also check the Ethernet cable connections to your PC and to the MicroNode.

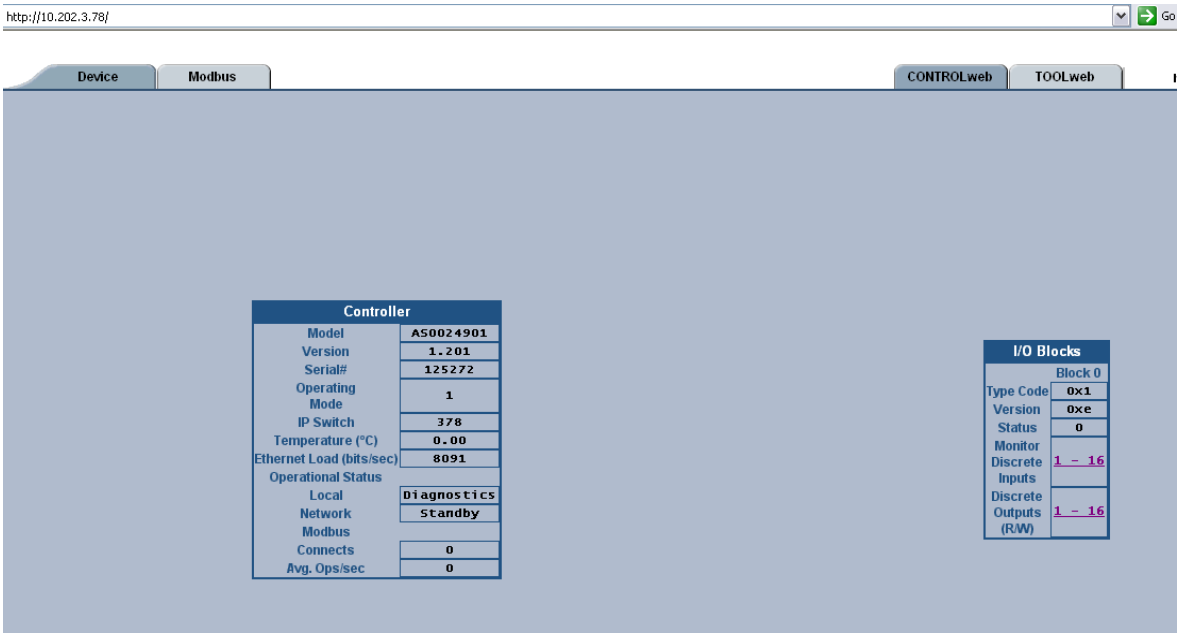

Figure 11 Device Web page

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- The Device page provides current status for the unit and provides basic control of the outputs through the I/O block links, control of the outputs is only allowed when the device is in **diagnostic mode**. Once in production mode, the outputs can no longer be controlled via the webpage.

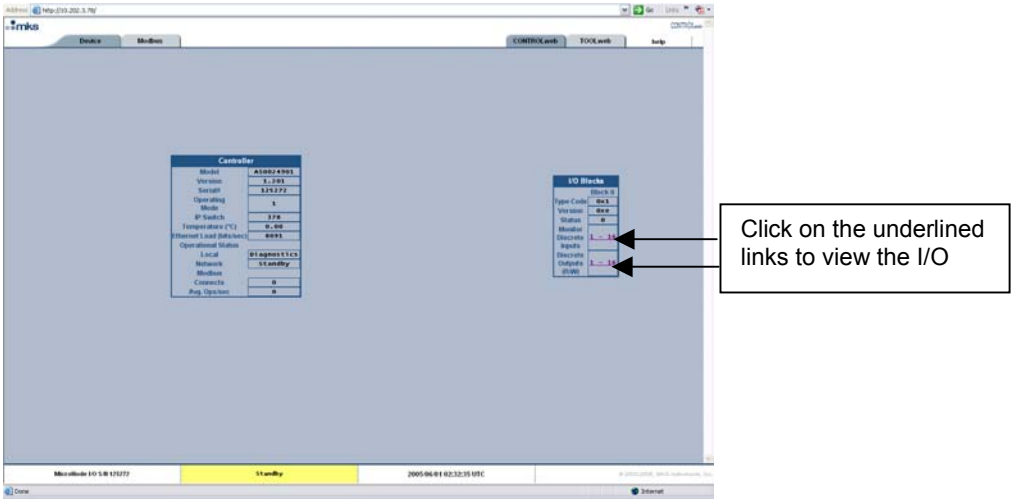

Figure 12 I/O Links on Homepage

- Selecting the underlined items in the I/O blocks chart will launch secondary I/O pages. The following figure show the digital input statuses that are displayed after an underlined link is selected.

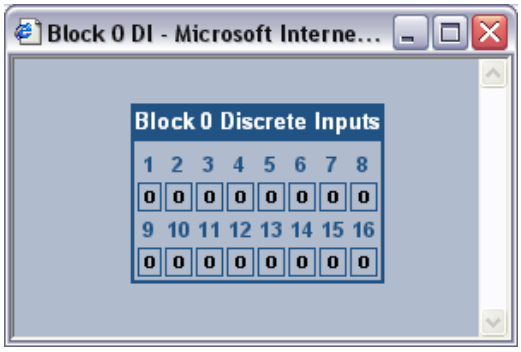

Figure 13 Digital Input Web Page

- The digital output webpage provides basic control of the output points if the unit is in **diagnostics mode**. The pull down menu allows the user to select the digital output state. There is also a Blinking Output pull down menu that allows the user to put an output into a blinking state.

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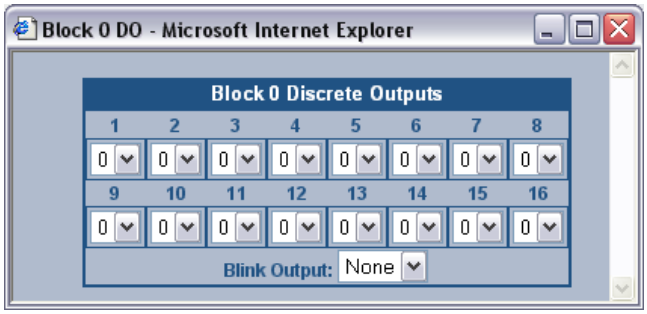
Block 0 DO - Microsoft Internet Explorer
Block 0 Discrete Outputs
1 2 3 4 5 6 7 8
0 0 0 0 0 0 0 0
9 10 11 12 13 14 15 16
0 0 0 0 0 0 0 0
Blink Output: None

Figure 14 Digital Output Webpage

- Click on the link for the digital output page. Change the state of one of the outputs by selecting an option from the pull down menu.

If the output does not come on, check the status and network LEDs on the front of the unit. The module LED should be blinking amber and the network LED should be blinking green. If the states are different, reference the LED status table in section 2.10. Also, check the + 24V power connection.

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4 Network Configuration

The MicroNode network settings configure the 100/10 BaseT Ethernet port. The following are factory-default Ethernet settings.

Parameter	Setting
IP-Address	192.168.0.X
Subnet Mask	255.255.255.0
Default Gateway	None

Note Reading or changing the network settings of an unknown unit is achieved by connecting via a serial terminal session. See section 4.2.

4.1 Connecting to a computer via TCP/IP

The Ethernet MicroNode is configured and controlled via its Ethernet port. The following steps show how to configure a Windows PC for first-time communication with a unit.

1) Connect the MicroNode to your PC by using an Ethernet crossover cable for direct point-to-point connection, or connect through an Ethernet switch or hub.

Note Some 10/100MB Ethernet interfaces may not detect the MicroNode when using an Ethernet crossover cable. If you experience problems, connect through an Ethernet switch or hub.

2) Change your PC network TCP/IP settings so that PC resides on same sub network as the MicroNode.

   Use the following TCP/IP settings if you have **not changed** the MicroNode IP address from its factory default.

   IP Address: 192.168.0.1
   Subnet Mask: 255.255.255.0
   Default Gateway: none

3) Open your PC web browser (Netscape, Internet Explorer, or equivalent). Enter the IP address in the web browser's address line.

   http://192.168.0.X

   The main page for the MicroNode will open.

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4.2 Connecting via a Serial Terminal Session

Connect your computer to the diagnostics port (DB9) using a standard null-modem cable.

Using a terminal program such as Microsoft® HyperTerminal or Tera Term Pro you can now communicate via the diagnostics port of the unit. The serial connection parameters are listed in the following table.

Table 6 Serial Connection Parameters

Parameter	Value
Baudrate	38400
Data bits	8
Parity	None
Stop bits	1
Flow Control	None

Once connected, the IP address can be changed by typing the **menu** command and pressing **m** within 3 seconds: The current IP address of the unit can be view by just typing **menu**.

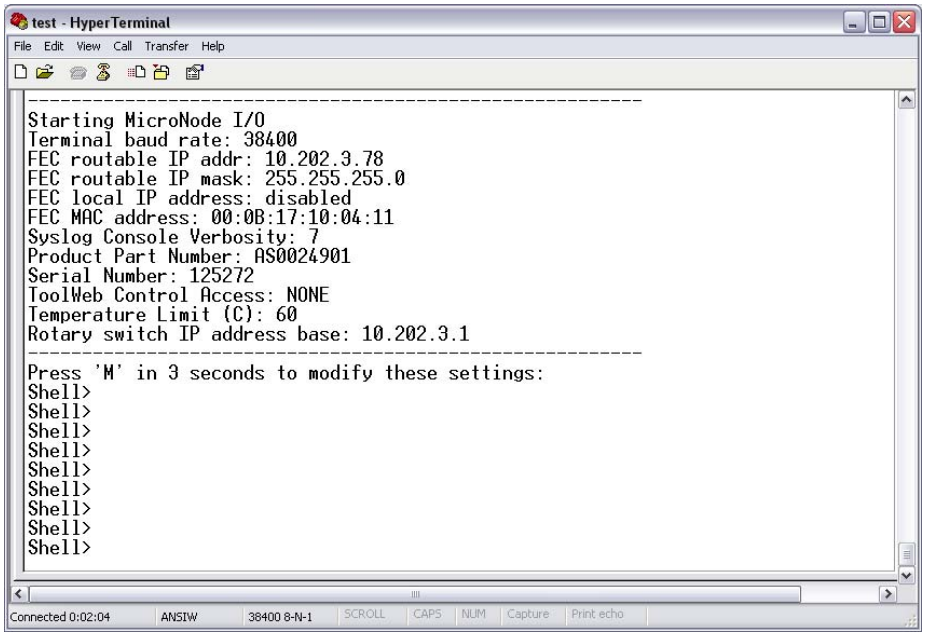

Figure 15 Serial Diagnostics Menu Command

The serial interface provides diagnostics for the device. The **help** command can be used to display all commands available through the serial interface.

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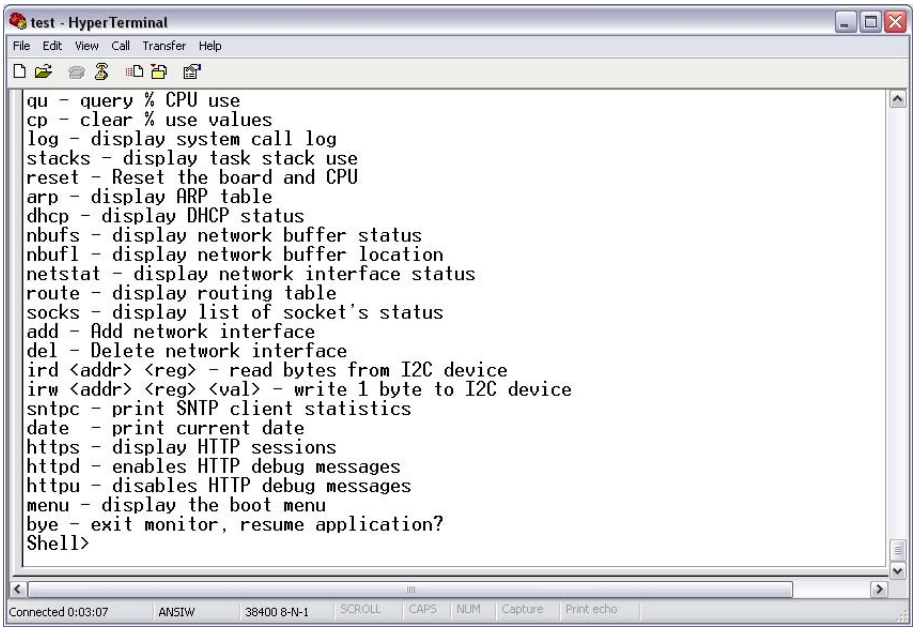
test - HyperTerminal
File Edit View Call Transfer Help
qu - query % CPU use
cp - clear % use values
log - display system call log
stacks - display task stack use
reset - Reset the board and CPU
arp - display ARP table
dhcp - display DHCP status
nbufs - display network buffer status
nbufl - display network buffer location
netstat - display network interface status
route - display routing table
socks - display list of socket's status
add - Add network interface
del - Delete network interface
ird <addr> <reg> - read bytes from I2C device
irw <addr> <reg> <val> - write 1 byte to I2C device
sntpc - print SNTP client statistics
date - print current date
https - display HTTP sessions
httpd - enables HTTP debug messages
httpu - disables HTTP debug messages
menu - display the boot menu
bye - exit monitor, resume application?
Shell>
Connected 0:03:07
ANSIW
38400 8-N-1
SCROLL
CAPS
NUM
Capture
Print echo

Figure 16 Serial Diagnostics Help Command

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5 CONTROLweb™ User Interface

The user interface is web based. You can access it by simply browsing to the IP address of the CONTROLweb™ node.

Note Microsoft Internet Explorer versions older than 5.5 may not function as expected due to limitations of the browser.

The main page of the CONTROLweb™ unit shows a top view of the module. This is referenced as the Device tab.

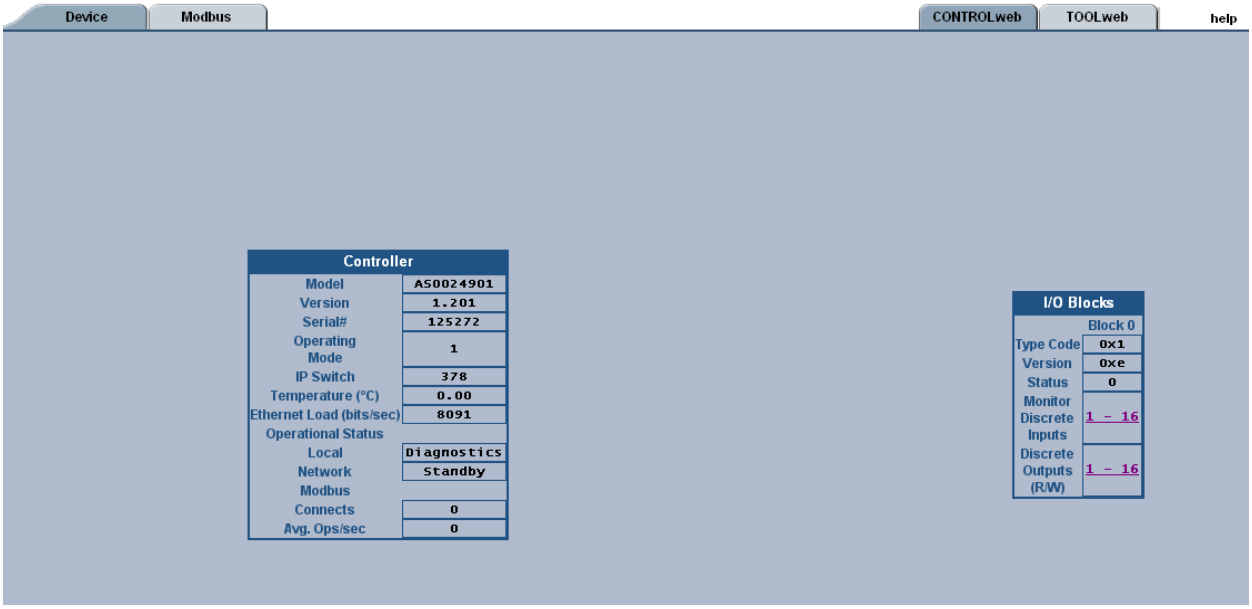

Figure 17 Device Homepage

Dynamic diagnostic details available from this page are:

- Unit data- model number, serial number, and software version
- Operational Mode
- Operation statistics
- Ethernet load
- Modbus details

By selecting I/O of interest from the main page, a pop-up will appear for each section of I/O.

- Inputs can be read. (Dynamic)
- Outputs can be set manually if the unit is in **diagnostics mode**

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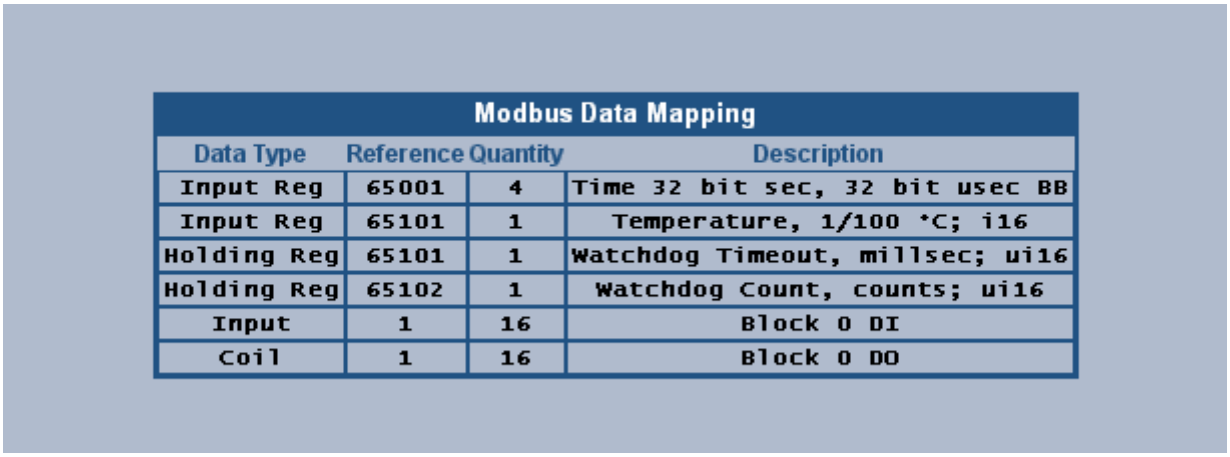
6 Modbus/TCP Interface

Use the Modbus mapping details provided through the web browser interface under the ***Configuration*** tab.



Modbus Data Mapping

Data Type	Reference	Quantity	Description
Input Reg	65001	4	Time 32 bit sec, 32 bit usec BB
Input Reg	65101	1	Temperature, 1/100 °C; i16
Holding Reg	65101	1	Watchdog Timeout, millsec; ui16
Holding Reg	65102	1	Watchdog Count, counts; ui16
Input	1	16	Block 0 DI
Coil	1	16	Block 0 DO

Figure 18 Modbus Data Mapping

The address map for the Modbus registers is listed in the table below.

Table 7 Modbus Register Map

Register Type	Address	Data Type	Range	Description
Input	0-15	Bool	0-1	Provides status of Block 0 and Block 1 Digital inputs
Coil	0-15	Bool	0-1	Controls Block 0 and Block 1 Digital Outputs
Input Reg	65000	Real		Real Time Clock value
Input Reg	65100	Int 16 bit	1-100	Internal Device Temperature in Degrees Celsius
Holding Reg	65100	Unsigned Int 16 Bit	0, 100-65535	Watchdog timeout value in Milliseconds. Writing a value of 0 to the register disables the Watchdog
Holding Reg	65101	Unsigned Int 16 Bit	0-65535	Watchdog Timeout counter, Writing to the register resets the counter

Table 8 Modbus Commands

Command	Description
ReadDiscreteInputs (0x02)	As defined in the MODBUS Application Protocol Specification, the device shall support reading one or more discrete inputs via the ReadDiscreteInputs function.

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ReadCoils (0x01)	For the purposes of this device, a coil shall be synonymous with a Discrete Output. As defined in the MODBUS Application Protocol Specification, the device shall support reading one or more coils (discrete outputs) via the ReadCoils function.
WriteSingleCoil (0x05)	
WriteMultipleCoils (0x0F)	
ReadHoldingRegisters (0x03)	As defined in the MODBUS Application Protocol Specification, the device shall support reading one or more registers via the ReadHoldingRegisters function.
WriteSingleRegister (0x06)	Is defined to access the HoldingRegisters. When accessing an IO point, the following method is used.

Note the digital input address is the reference number of the digital input minus one. (**DI address = Reference of DI Number – 1)**

For example for DI number = 4 with a reference of 4, the DI address would be 3.
Map this data in your Modbus/TCP scanner.

Note **For more details on Modbus, see** http://www.modbus.org**.**

WATCHDOG TIMER

The Modbus/TCP Interface includes a watchdog timer to monitor and react in the event that communications are not maintained between the client and the server within a programmed amount of time. If time between communications exceeds the timeout value (programmed into the Watchdog Timeout Value Holding Register) a timeout will occur and the Watchdog Timeout Counter register will increment 1 count for every timeout event that occurs. In the event that a timeout occurs the Status LED will alternate between red-amber and green. Once a timeout occurs all outputs are disabled.

The Watchdog Timeout value can be set from 100 ms to 65535 ms and can be disabled by writing a value of 0 to the register. The Watchdog Timeout Counter increments on each timeout event and is cleared by writing any value to the register.

Note To ensure that the Watchdog Counter register is cleared the register should be written to during initialization.

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7 TOOLweb™ Interface

TOOLweb™ is a system-wide program for enabling and gathering real-time data from multiple elements of a process, and providing this data to factory based modules for analysis, FDC and APC.

The Ethernet MicroNode uses TOOLweb™ functionality for the following:

- Web based tools for data analysis and debug, directly from the I/O module
- Real time data acquisition, using XML over HTTP

7.1 TOOLweb™ User Interface

TOOLweb™ functions are accessed and configured through the web browser interface. Users must determine the Key Process Variables. Once these variables are named and scaled, they are available for data collection and analysis.

7.1.1 Control Access

Create the allowed permissions to process data.

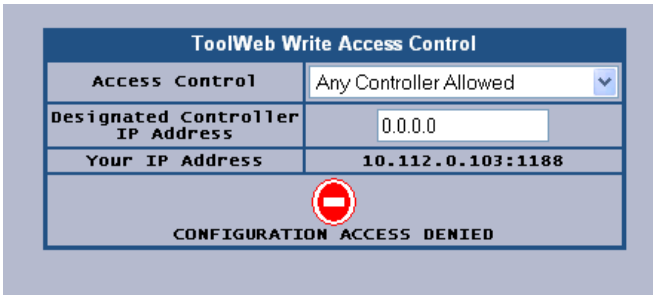

Figure 19 Access Control

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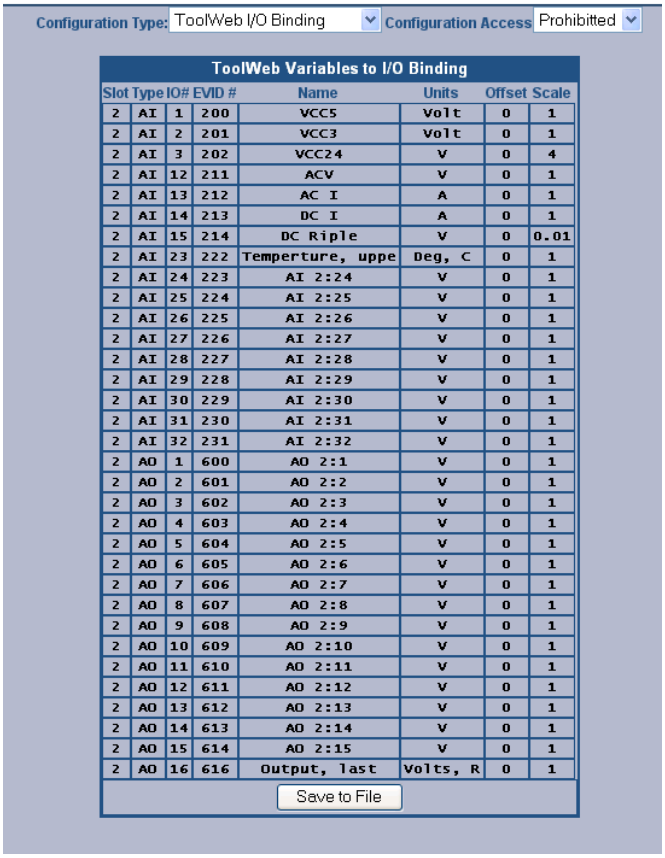
7.1.2 I/O Bindings

Select the I/O points to be available for TOOLweb™ functions. Each point is selected, given a description, and scaled to meaningful process units. Up to 64 variables can be configured.


Configuration Type: ToolWeb I/O Binding
Configuration Access Prohibitted
ToolWeb Variables to I/O Binding
Save to File

Slot	Type	IO#	EVID #	Name	Units	Offset	Scale
2	AI	1	200	VCC5	Volt	0	1
2	AI	2	201	VCC3	Volt	0	1
2	AI	3	202	VCC24	V	0	4
2	AI	12	211	ACV	V	0	1
2	AI	13	212	AC I	A	0	1
2	AI	14	213	DC I	A	0	1
2	AI	15	214	DC Riple	V	0	0.01
2	AI	23	222	Temperture, uppe	Deg, C	0	1
2	AI	24	223	AI 2:24	V	0	1
2	AI	25	224	AI 2:25	V	0	1
2	AI	26	225	AI 2:26	V	0	1
2	AI	27	226	AI 2:27	V	0	1
2	AI	28	227	AI 2:28	V	0	1
2	AI	29	228	AI 2:29	V	0	1
2	AI	30	229	AI 2:30	V	0	1
2	AI	31	230	AI 2:31	V	0	1
2	AI	32	231	AI 2:32	V	0	1
2	AO	1	600	AO 2:1	V	0	1
2	AO	2	601	AO 2:2	V	0	1
2	AO	3	602	AO 2:3	V	0	1
2	AO	4	603	AO 2:4	V	0	1
2	AO	5	604	AO 2:5	V	0	1
2	AO	6	605	AO 2:6	V	0	1
2	AO	7	606	AO 2:7	V	0	1
2	AO	8	607	AO 2:8	V	0	1
2	AO	9	608	AO 2:9	V	0	1
2	AO	10	609	AO 2:10	V	0	1
2	AO	11	610	AO 2:11	V	0	1
2	AO	12	611	AO 2:12	V	0	1
2	AO	13	612	AO 2:13	V	0	1
2	AO	14	613	AO 2:14	V	0	1
2	AO	15	614	AO 2:15	V	0	1
2	AO	16	616	Output, last	Volts, R	0	1

Figure 20 Collection Variables

7.1.3 Data Collection Plans

A data collection plan selects the process variables of interest, and the frequency of data collection. Each collection plan can then be viewed using a Charting Applet, or can be downloaded in CSV format to your local PC.

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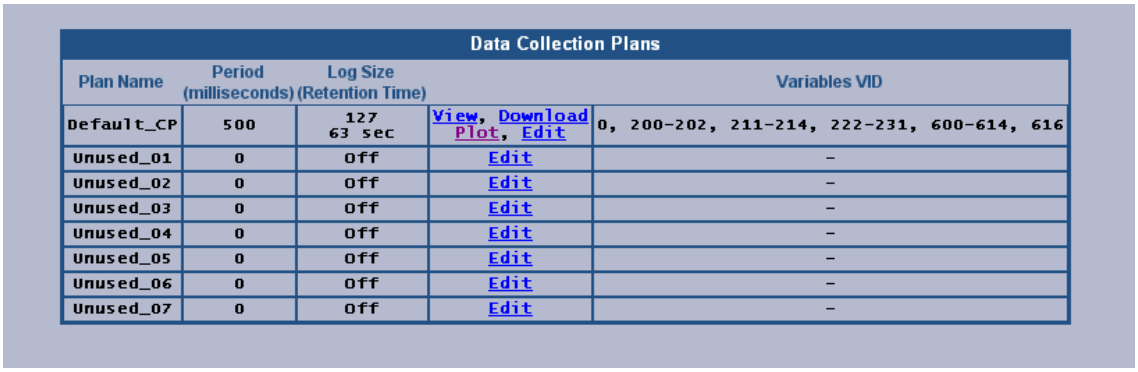

Data Collection Plans

Plan Name	Period (milliseconds)	Log Size (Retention Time)		Variables VID
Default_CP	500	127 63 sec	View, Download Plot, Edit	0, 200-202, 211-214, 222-231, 600-614, 616
Unused_01	0	Off	Edit	-
Unused_02	0	Off	Edit	-
Unused_03	0	Off	Edit	-
Unused_04	0	Off	Edit	-
Unused_05	0	Off	Edit	-
Unused_06	0	Off	Edit	-
Unused_07	0	Off	Edit	-

Figure 21 Collection Plan

7.1.4 Data Collection Plan Editing

Create a collection plan, and select the key process variables of interest:

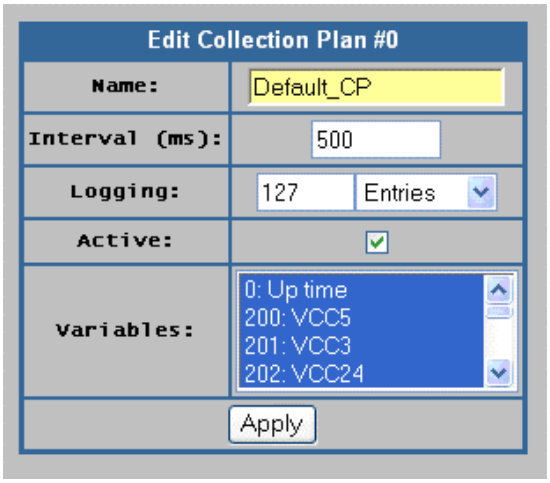

Figure 22 Edit Collection Plan

7.1.5 Charting Applet

Once a data collection plan is configured, you can view the data using a built-in charting applet.

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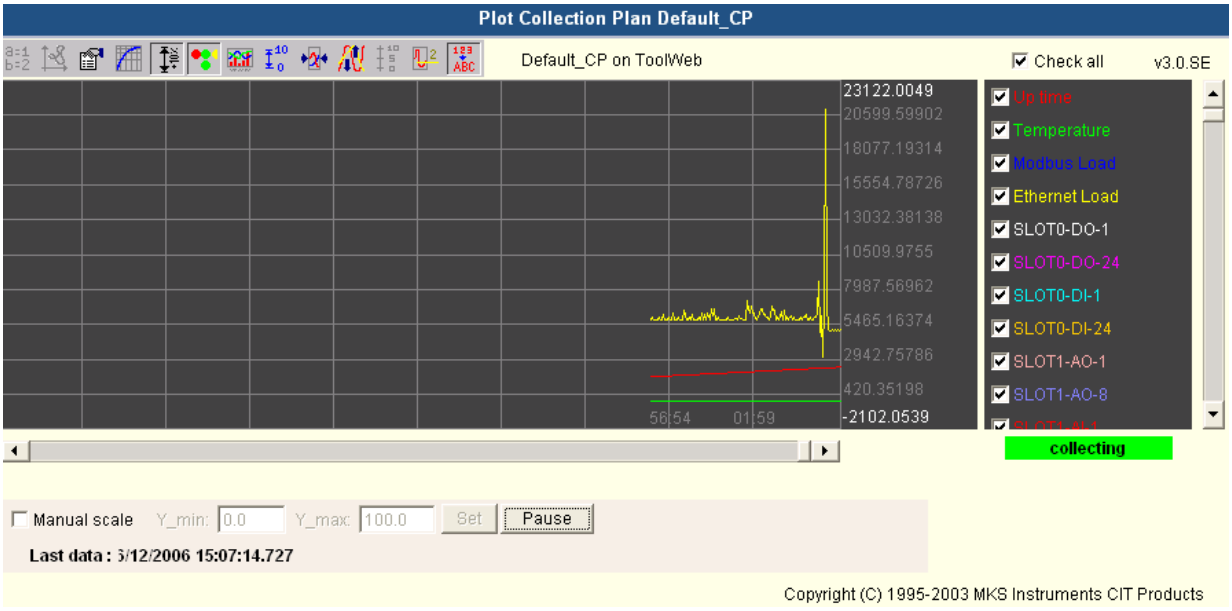

Figure 23 Charting Applet

7.1.6 Download Data to Local PC

Collection plan data can also be downloaded in CSV format:

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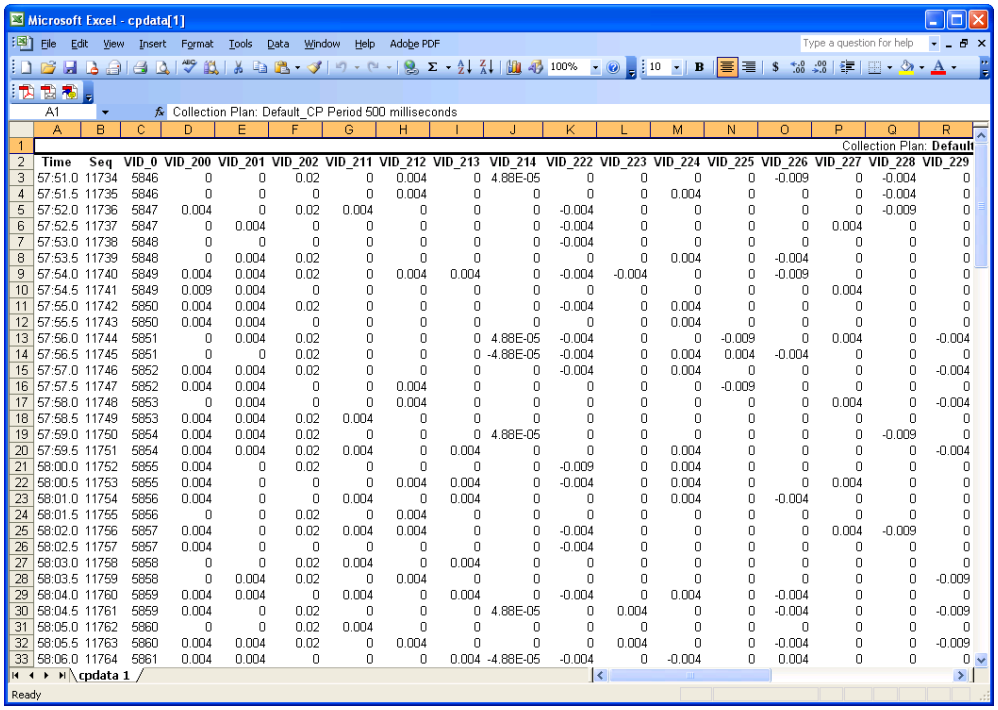

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																	Collection Plan: Default	
2	Time	Seq	VID_0	VID_200	VID_201	VID_202	VID_211	VID_212	VID_213	VID_214	VID_222	VID_223	VID_224	VID_225	VID_226	VID_227	VID_228	VID_229
3	57:51.0	11734	5846	0	0	0.02	0	0.004	0	4.88E-05	0	0	0	0	-0.009	0	-0.004	0
4	57:51.5	11735	5846	0	0	0	0	0.004	0	0	0	0	0.004	0	0	0	-0.004	0
5	57:52.0	11736	5847	0.004	0	0.02	0.004	0	0	0	-0.004	0	0	0	0	0	-0.009	0
6	57:52.5	11737	5847	0	0.004	0	0	0	0	0	-0.004	0	0	0	0	0.004	0	0
7	57:53.0	11738	5848	0	0	0	0	0	0	0	-0.004	0	0	0	0	0	0	0
8	57:53.5	11739	5848	0	0.004	0.02	0	0	0	0	0	0	0.004	0	-0.004	0	0	0
9	57:54.0	11740	5849	0.004	0.004	0.02	0	0.004	0.004	0	-0.004	-0.004	0	0	-0.009	0	0	0
10	57:54.5	11741	5849	0.009	0.004	0	0	0	0	0	0	0	0	0	0	0.004	0	0
11	57:55.0	11742	5850	0.004	0.004	0.02	0	0	0	0	-0.004	0	0.004	0	0	0	0	0
12	57:55.5	11743	5850	0.004	0.004	0	0	0	0	0	0	0	0.004	0	0	0	0	0
13	57:56.0	11744	5851	0	0.004	0.02	0	0	0	4.88E-05	-0.004	0	0	-0.009	0	0.004	0	-0.004
14	57:56.5	11745	5851	0	0	0.02	0	0	0	-4.88E-05	-0.004	0	0.004	0.004	-0.004	0	0	0
15	57:57.0	11746	5852	0.004	0.004	0.02	0	0	0	0	-0.004	0	0.004	0	0	0	0	-0.004
16	57:57.5	11747	5852	0.004	0.004	0	0	0.004	0	0	0	0	0	-0.009	0	0	0	0
17	57:58.0	11748	5853	0	0.004	0	0	0.004	0	0	0	0	0	0	0	0.004	0	-0.004
18	57:58.5	11749	5853	0.004	0.004	0.02	0.004	0	0	0	0	0	0	0	0	0	0	0
19	57:59.0	11750	5854	0.004	0.004	0.02	0	0	0	4.88E-05	0	0	0	0	0	0	-0.009	0
20	57:59.5	11751	5854	0.004	0.004	0.02	0.004	0	0.004	0	0	0	0.004	0	0	0	0	-0.004
21	58:00.0	11752	5855	0.004	0	0.02	0	0	0	0	-0.009	0	0.004	0	0	0	0	0
22	58:00.5	11753	5855	0.004	0	0	0	0.004	0.004	0	-0.004	0	0.004	0	0	0.004	0	0
23	58:01.0	11754	5856	0.004	0	0	0.004	0	0.004	0	0	0	0.004	0	-0.004	0	0	0
24	58:01.5	11755	5856	0	0	0.02	0	0.004	0	0	0	0	0	0	0	0	0	0
25	58:02.0	11756	5857	0.004	0	0.02	0.004	0.004	0	0	-0.004	0	0	0	0	0.004	-0.009	0
26	58:02.5	11757	5857	0.004	0	0	0	0	0	0	-0.004	0	0	0	0	0	0	0
27	58:03.0	11758	5858	0	0	0.02	0.004	0	0.004	0	0	0	0	0	0	0	0	0
28	58:03.5	11759	5858	0	0.004	0.02	0	0.004	0	0	0	0	0	0	0	0	0	-0.009
29	58:04.0	11760	5859	0.004	0.004	0	0.004	0	0.004	0	-0.004	0	0.004	0	-0.004	0	0	0
30	58:04.5	11761	5859	0.004	0	0.02	0	0	0	4.88E-05	0	0.004	0	0	-0.004	0	0	-0.009
31	58:05.0	11762	5860	0	0	0.02	0.004	0	0	0	0	0	0	0	0	0	0	0
32	58:05.5	11763	5860	0.004	0.004	0.02	0	0.004	0	0	0	0.004	0	0	-0.004	0	0	-0.009
33	58:06.0	11764	5861	0.004	0.004	0	0	0	0.004	-4.88E-05	-0.004	0	-0.004	0	0.004	0	0	0

Figure 24 Collection Plan Data

7.2 TOOLweb™ Tool Side Interface

The tool side interface is relevant when a MicroNode is connected to a BlueBox™ in a semiconductor process tool APC, and e-diagnostic system.

The following messages are supported via the TOOLweb™ tool side Interface:

Table 9 TOOLweb Messages

Message	Supported
CapabilitiesRequest/Response	Yes
Polling	Yes
Tracing	Yes
Bulktrace	No
Events	No
ControlParameter	Yes
SetRequest/Response	No

The names and units as exposed in the CapabilitesResponse are the same as defined in the channel configuration. Reference the BlueBox™ Manual for additional details on interfacing with BlueBox™.

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Note

Microsoft Internet Explorer 5.0.1 or higher is required. Microsoft Internet Explorer versions less than 5.5 may not function as expected due to limitations of the browser.

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8 Appendix A - Specifications

Physical Specifications

Criteria	Specifications
Dimensions	80mm (3.1496”) Height X 120mm (4.7244”) Width X 34mm (1.339”) Depth
I/O Connector	37-pin male D-sub
Ethernet Connector	100 BaseT, RJ45 with EMI filter,LED indicators
RS-232 Connector	38,400 bps, TXD, RXD; DB9 connector
Weight	200 g (0.44 lb)

Environmental Specifications

Criteria	Specifications
Operating Temperature	0 to +55°C
Storage	-40 to +85 °C
Humidity	5 to 95% non-condensing

Functional Specifications

Criteria	Specifications
BUS Interface	Ethernet –Modbus/TCP
Front Panel Indicators	16 Digital I/O points, Network Status, Module Status
Rotary Switches	IP address, operating mode

Power Specifications

Criteria	Specifications
Input	Powered from I/O connector +24VDC@120 mA min
Isolation	DC/DC Isolation

Input/Output Specifications

Criteria	Specifications
Number of Digital I/O	16 points (input or output)
Digital Input	
Current sinking	Active Low- 1.5 mA min,
Current sourcing	Active High-1.5 mA min,
Digital Output	
Current sinking	Active low, 200 mA max / channel
Current sourcing	Active high, 200 mA max / channel
Current max	800 mA for DIO 0-7, and DIO 8-15

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